THE SPERMATOCYTIC DIVISIONS OF LEPTOCORIS HÆMATOLOMA.[1]

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INTRODUCTION.

The spermatogenesis of *Leptocoris hæmatoloma* (family Coreidæ) very closely resembles that of *Anasa tristis*, as described by Paulmier. During the past few years it has been used extensively here in the course on cytology to demonstrate the behavior of the X-chromosome. As a matter of record, it seems worth while to give a very brief account of the spermatocytic divisions. Furthermore, the material is very fine for the study of tetrad formation, and it is hoped later to publish an account of this process.

The material on which these observations were made was collected in November and December, 1914, on the plant *Cardiospermum halicacabum*, the balloon vine which is very common in this vicinity. It may be of interest, however, to know that this is the only plant on which we have found this bug. The testes, which are large yellow pear-shaped bodies located at the base of the third pair of walking legs were dissected out in Ringer's solution and fixed immediately in Bouin's fluid. They were stained with iron hæmatoxylin and counterstained with eosin and light-green. Other fixing agents were used, but this proved to be the best.

The material is excellent for the study of spermatogenesis, as the chromosomes are not numerous, and vary greatly in size. It is possible to follow accurately the courses of the smallest, largest and accessory chromosomes throughout their entire history.

The spermatogonial complex of *Leptocoris hæmatoloma* consists of thirteen chromosomes (Figs. 1 and 2). These vary in size, but can be classified in three groups. The members of two pairs

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are quite large, three pairs are of medium size, while the sixth pair and the accessory chromosome are rather small. On account of their size and shape, one has little difficulty in recognizing the members of the various pairs.

After a series of successive spermatogonial divisions, the thirteen chromosomes pass through the characteristic synaptic and growth stages, giving rise to six tetrads and one dyad, typical of the primary spermatocyte. These tetrads vary greatly in size, the largest and smallest being easily recognized in Figs. 3 and 4. Three of the tetrads approximate each other very closely, and the remaining one is slightly smaller than the largest. The dyad representing the accessory chromosome lies close to the nuclear wall in Figs. 3 and 4, but I have no reason to believe that this is necessarily characteristic. Figs. 3 and 4 were selected because in each the entire number is seen, though scattered irregularly throughout the nucleus. At this stage the nuclear membrane is intact and the cell itself has increased enormously in size.

The tetrads are then drawn into the central plate and there is no question as to their final arrangement Fig. 5 shows the typical position of the various chromosomes in the central plate of the first spermatocyte. I have examined numbers of cells and at this stage have always found the six chromosomes arranged in a ring with the smallest in the center. The accessory chromosome always lies in the circle. Paulmier has found this to be the case in *Podisus*, *Lygæus* and *Chariesterus*, but Henking finds no such peculiar arrangement in *Pyrrochoris*.

First Spermatocytic Division.

The spindle of the primary spermatocyte is ordinarily rather broad but as the chromosomes begin to pull apart, it becomes in many cases, long and slender. The fibers of the spindle converge at the poles, but no centrosomes could be found in any of these stages. This may have been due to the stains used. The chromosomes in the metaphase plate do not divide synchronously. The accessory tends to divide precociously (Figs. 8 and 9) and is generally followed by the smallest chromosome (Figs. 6 and 7). As the accessory advances toward the poles,

the larger chromosomes are seen to be pulled apart. As they divide and separate they are usually still connected by two thick threads (Figs. 6, 7, 9). These fibers stain deeply with hæmatoxylin but are lost sight of as the chromosomes are pulled farther apart and the cell wall begins to constrict. There is no sign of a zwischenkörper as described by Paulmier for Anasa. Each of the two resulting secondary spermatocytes (Figs. 11, 12, 13) contains six chromosomes in the form of dyads and one monad, the accessory. There is no trouble identifying the accessory because of its size and position.

Second Spermatocytic Division.

The second division follows directly upon the first without any resting stage. In the equatorial plate of the second division the chromosomes are arranged in the characteristic ring of six with the smallest chromosome in the center. In the case of *Anasa tristis* Paulmier finds no such regular arrangement though he says the small chromosome generally lies in the center. The chromosomes now arrange themselves on the middle of the spindle and very soon the accessory is seen to leave the group and pass undivided in advance of the others toward one of the poles (Figs. 14, 16, 17, 18, 19, 20). In *Anasa* the accessory lags, and is not drawn toward one of the poles until the other chromosomes have practically come to the end of their movement. The remaining dyads then divide apparently in the same order as for the first division, the smallest leading (Figs. 15, 17, 19). These then pass to opposite poles and the cell constricts in the middle. The resulting cells are smaller than those of the first division, half of them containing seven chromosomes, and half six (Figs. 21, 22, 23, 14). The chromosomes of these spermatids have the same characteristic arrangement as those of the primary and secondary spermatocytes, one half of them having a ring of six with a small one in the center and the other a ring of five with the small one also in center. There is a typical massing of the chromosomes in the spermatid before the nuclear wall is formed.

The spindle of the second spermatocyte is similar in shape to that of the first, being rather broad and thick at the initiation

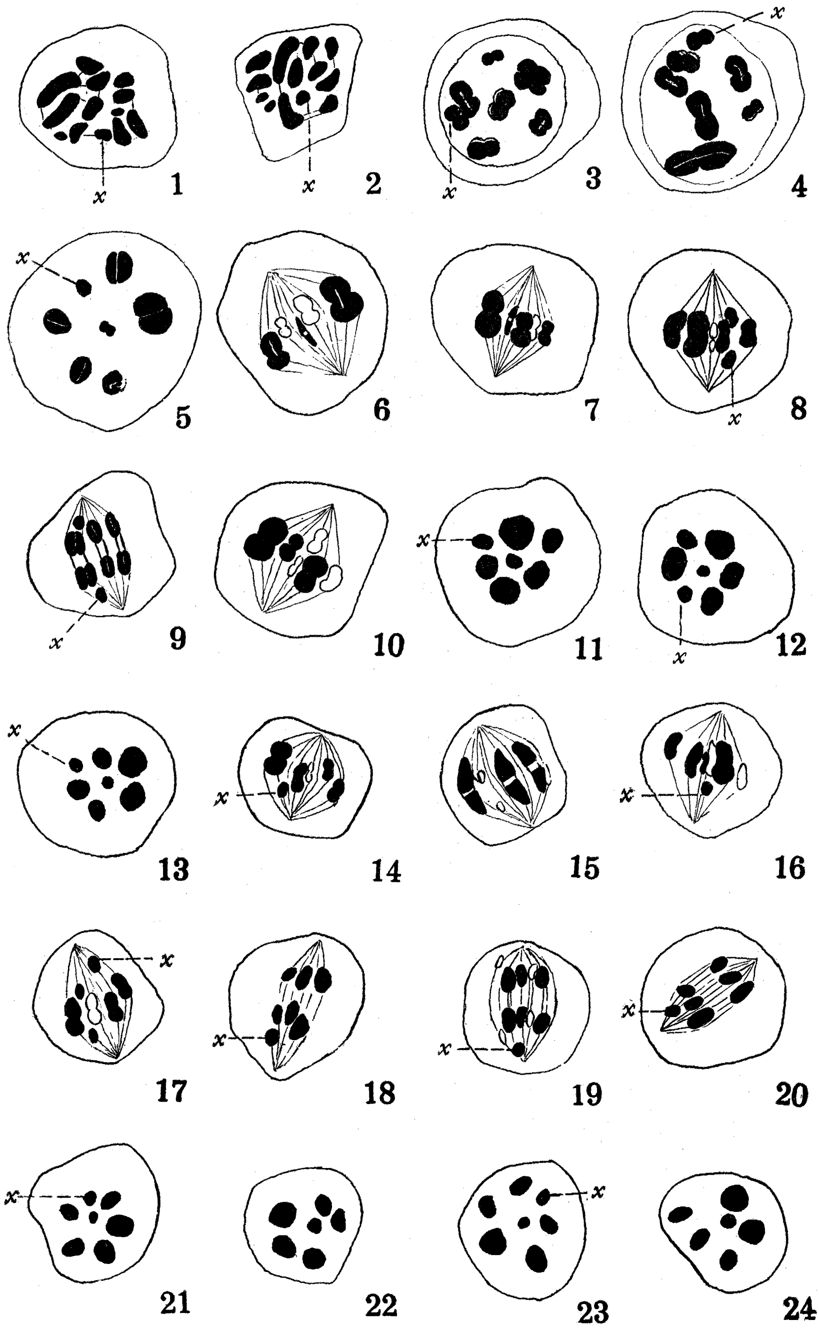
of division, and as the chromosomes are pulled apart, taking on a slender elongated appearance.

In conclusion it may be suggested that the female has two X-chromosomes, or fourteen in all. Wilson reports that *Leptocoris trivittatus* has fourteen in the female and thirteen in the male.

Explanation of Plate I.

All drawings were made with the aid of a camera lucida at table level. A Zeiss microscope with compensating 12 ocular and 2 mm. oil immersion objective was used. The drawings have been reduced one third off.

1, 2. Equatorial plate of spermatogonia.
3, 4. Tetrad stages, showing all chromosomes.
5. Polar view of first spermatocyte.
6–8. Side view of same.
9. Early anaphase of first division.
10. Side view of first spermatocyte division.
11–13. Polar view of second spermatocyte.
14–20. Second spermatocytic division.
21, 22. Spermatids, corresponding daughter cells.
23, 24. Spermatids, corresponding daughter cells.



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